2003 REGIONAL AMBIENT FISH TISSUE MONITORING PROGRAM; SUMMARY OF THE IOWA FISH ANALYSES

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Introduction:

To supplement other environmental monitoring programs and to protect the health of people consuming fish from waters within this state, the state of Iowa conducts fish tissue monitoring. Since 1980, the Iowa Department of Natural Resources (IDNR), the United States Environmental Protection Agency Region VII (U.S. EPA), and the University of Iowa Hygienic Laboratory (UHL) have cooperatively conducted annual statewide collections and analyses of fish for toxic contaminants. Beginning in 1983, this monitoring effort became the Regional Ambient Fish Tissue Monitoring Program (the RAFT program). Currently, the RAFT program is the only statewide fish contaminant-monitoring program in Iowa. Historically, the data generated from the RAFT program have enabled IDNR to document temporal changes in contaminant levels and to identify Iowa lakes and rivers where high levels of contaminants in fish potentially threaten the health of Iowans consuming fish. The Iowa RAFT monitoring program incorporates three different but equally important types of monitoring sites: 1) status, 2) trend, and 3) follow-up.

Status monitoring:

The majority of RAFT sites sampled each year determine whether the waterbodies meet the “fish consumption” portion of the fishable goal of the federal Clean Water Act. In other words, these sites are used to screen for contamination problems and to determine the water quality "status" of the waterbodies. Analyses for a variety of pesticides, other toxic organic compounds, and metals are conducted on samples of omnivorous bottom-dwelling fish and carnivorous predator fish. Most status sites on rivers and lakes have either never been sampled or have not been sampled within the last five years (rivers) or 10 years (lakes). Staff of the IDNR divisions of Environmental Services and Fish & Wildlife selects status sites. Status monitoring occurs on most types of Iowa waterbodies (interior rivers, border rivers, and manmade and natural lakes) in both rural and urban areas. Lakes and river reaches known to support considerable recreational fishing receive highest priority, but IDNR attempts to sample all lakes and river reaches designated in the *Iowa Water Quality Standards* for recreational fishing. Approximately one-third to one-half of Iowa RAFT status sites is on lakes; the remaining sites are either on interior rivers or on the border rivers (Mississippi, Missouri or Big Sioux).

Trend monitoring:

In 1994, U.S. EPA Region VII, in cooperation with the Region VII states (Iowa, Kansas, Missouri, and Nebraska), identified stations that would be monitored every other year to determine trends in levels of contamination. One sample of three to five common carp from each station is submitted for whole-fish analysis. Whole-fish samples are more likely to contain detectable levels of most contaminants than are fillet samples (edible portions). Examination of the trend monitoring results may help identify temporal changes in contaminant concentrations and may expose new contaminants entering the food chain. In Iowa, the following ten locations are part of the RAFT trend monitoring.

Stations first sampled in 1994 and sampled in even years since:

1. Mississippi River downstream from Dubuque, Dubuque County
2. Mississippi River downstream from Linwood, Scott County
3. Wapsipinicon River north of Donahue, Scott County
4. Des Moines River at Keosauqua, Van Buren County
5. Little Sioux River near Washta, Ida County

Stations first sampled in 1995 and sampled in odd years since:

6. Mississippi River at Lansing, Allamakee County
7. Maquoketa River at Maquoketa, Jackson County
8. Iowa River at Wapello, Louisa County
9. Skunk River at Augusta, Lee County
10. Des Moines River at Des Moines, Polk County

Only four of the five trend sites scheduled for the 2003 RAFT were sampled: river levels were too low to allow sampling of the Des Moines River at Des Moines (Polk County). This trend site will be sampled again for the 2005 RAFT program.

Follow-up Monitoring:

If levels of contaminants in status samples exceed federal guidelines and/or IDNR levels of concern (Table 1), the RAFT program conducts follow-up monitoring to better define the levels of contaminants. For example, if status monitoring shows that contaminant levels in fish from a waterbody exceed IDNR levels of concern, additional samples will be collected as part of follow-up monitoring for the next year's RAFT program. If follow-up monitoring shows that levels of contamination exceed federal guidelines for protection of human health, IDNR may conduct intensive follow-up monitoring. This will allow the confirmation that contaminant levels exceed guidelines and the issuance of a fish consumption advisory is justified.

2003 Results:

The 2003 RAFT program in Iowa involved the collection of 33 samples from 20 waterbodies for the three types of RAFT sites (Table 2). In July, August, and September, IDNR fisheries biologists collected, processed, and prepared the 2003 RAFT samples for shipping. These activities were conducted according to procedures described in the workplan for the 2003 RAFT in Iowa (IDNR 2003). Once frozen, samples were transported or shipped to the Des Moines office of the UHL. Samples were stored at the UHL until shipment to the U.S. EPA Region VII laboratory in Kansas City, Kansas. All samples were shipped to the U.S. EPA Region VII laboratory for analysis by December 2003. Samples were analyzed for a variety of contaminants, including pesticides, other toxic organic compounds, and toxic metals (Table 1). IDNR received results of all sample analyses by August 2004.

Status monitoring in 2003 included collection of 27 composite fillet samples from 14 sites. Trend monitoring included collection of four composite whole-fish samples of common carp from four sites. Follow-up monitoring included two collections of composite channel catfish fillet from two sites. The criteria used to evaluate the results of this monitoring (i.e., U.S. Food and Drug Administration (FDA) action levels (ALs) and IDNR "levels of concern") are summarized in Table 1. Levels of nearly all contaminants were low in all samples collected. Results for total mercury, total PCBs, and technical chlordane are summarized in Table 2 and in Figures 1 and 2.

References:

IDNR. 2003. Sampling procedures for the 2003 Region VII Ambient Fish Tissue Monitoring Program in Iowa. Water Quality Bureau, Environmental Protection Division, Iowa Department of Natural Resources. 20 pp.

Table 1. Summary of contaminants and respective criteria for samples of fish collected for the 2003 Regional Ambient Fish Tissue (RAFT) monitoring program in Iowa.

	Contaminant	Detection Level wet weight ppm**	FDA Action Level wet weight ppm	IDNR "level of concern" wet weight ppm
1	BHC (lindane)	0.002	none	0.1
2	cadmium	0.06	none	0.3
3	chlordane, technical	0.03	0.3	0.15
4	chlordane, cis-	0.002	sum = 0.3	sum = 0.15
5	chlordane, trans-	0.002		
6	nonachlor, cis-	0.002		
7	nonachlor, trans-	0.002		
8	oxychlordane	0.002		
9	DDD, 4,4'-	0.004	sum = 5.0	sum = 2.5
10	DDE, 4,4'-	0.005		
11	DDT, 4,4'-	0.005		
12	diazinon*	0.04	none	none
13	dieldrin	0.003	0.3	0.15
14	heptachlor	0.003	sum = 0.3	sum = 0.15
15	heptachlor epoxide	0.003		
16	hexachlorobenzene	0.001	none	0.01
17	lead	0.17	none	1.0
18	mercury	0.0181	1.0	0.5
19	mirex*	0.003	0.1	0.05
20	PCB-Aroclor 1248	0.04	sum = 2.0	sum = 1.0
21	PCB-Aroclor 1254	0.03		
22	PCB-Aroclor 1260	0.002		
23	pentacloroanisole	0.001	none	0.1
24	pentachlorobenzene*	0.001	none	
25	selenium	0.5	none	
26	1,2,4,5-tetrachlorobenzene*	0.004	none	
27	trifluralin	0.003	none	0.2

*trend samples only

**ppm = parts per million and is equivalent to milligrams/kilogram (mg/kg)

Table 2. Summary of samples, sample sites, species sampled, and results for mercury, total PCBs (sum of Aroclors 1248, 1254 and 1260), and technical chlordane collected for the 2003 RAFT program in Iowa.

RAFT Site	Biologist	Sample Type	Fish Species (all fillets except Trend sites)	Total PCBs (mg/kg)	Technical Chlordane (mg/kg)	Mercury (mg/kg)	Information
Des Moines River at Cliffland Access, Wapello Co.	Flammang	Followup	Channel Catfish	0.17	0.081	0.157	History of somewhat elevated chlordane levels.
Iowa River at Iowa City, Johnson Co.	Sleeper	Followup	Channel Catfish	0.187	0.1	0.105	History of somewhat elevated chlordane levels.
Black Hawk Lake at Lake View, Sac Co.	Miller	Status	Black Crappie	<0.09	<0.03	<0.0181	Lake not sampled for 10 years.
Black Hawk Lake at Lake View, Sac Co.	Miller	Status	Common Carp	<0.09	<0.03	<0.0181	Lake not sampled for 10 years.
Cedar River at Midway (6 mi DS of Charles City), Floyd Co.	Kalishek	Status	Channel Catfish	0.119	<0.03	0.107	River not sampled for five years; lower mercury in 2003 samples than in 1988 and 1997 samples.
Cedar River at Midway (6 mi DS of Charles City), Floyd Co.	Kalishek	Status	Smallmouth Bass	<0.09	<0.03	0.124	River not sampled for five years; lower mercury in 2003 samples than in 1988 and 1997 samples.
Chariton River North of Centerville, Appanoose Co.	Flammang	Status	Channel Catfish	<0.09	<0.03	0.119	River not sampled for five years.
Grand (Thompson) River NW of Davis City, Decatur Co.	Sobotka	Status	Channel Catfish	<0.09	<0.03	0.048	River not sampled for five years.
Grand (Thompson) River NW of Davis City, Decatur Co.	Sobotka	Status	Flathead Catfish	<0.09	<0.03	0.074	River not sampled for five years.
Little Cedar River at Chickasaw Park, Chickasaw Co.	Kalishek	Status	Common Carp	<0.09	<0.03	0.097	River not previously sampled for RAFT.
Little Cedar River at Chickasaw Park, Chickasaw Co.	Kalishek	Status	Smallmouth Bass	<0.09	<0.03	0.225	River not previously sampled for RAFT..
Little Spirit Lake North of Spirit Lake, Dickinson Co.	Christianson	Status	Common Carp	<0.09	<0.03	0.019	Lake not previously sampled.
Little Spirit Lake North of Spirit Lake, Dickinson Co.	Christianson	Status	Walleye	<0.09	<0.03	0.04	Lake not previously sampled.
Lower Pine Lake near Eldora, Hardin Co.	Wahl	Status	Channel Catfish	<0.09	<0.03	<0.0181	Lake not previously sampled for RAFT.
Lower Pine Lake near Eldora, Hardin Co.	Wahl	Status	Largemouth Bass	<0.09	<0.03	0.048	Lake not previously sampled for RAFT.

RAFT Site	Biologist	Sample Type	Fish Species (all fillets except Trend sites)	Total PCBs (mg/kg)	Technical Chlordane (mg/kg)	Mercury (mg/kg)	Information
Mississippi River at Keokuk / below lock & dam 19, Lee Co.	Schonhoff	Status	Common Carp	0.227	0.075	0.126	River not sampled for five years.
Mississippi River at Keokuk / below lock & dam 19, Lee Co.	Schonhoff	Status	White Bass	<0.09	<0.03	0.136	River not sampled for five years.
Mississippi River Near Comanche at Shricker Slough	Boland	Status	Common Carp	<0.09	<0.03	0.079	River not sampled for five years.
Mississippi River Near Comanche at Shricker Slough	Boland	Status	White Crappie	<0.09	<0.03	<0.0181	River not sampled for five years.
North Fork Maquoketa River DS from Cascade, Jones Co.	Hayes	Status	Common Carp	<0.09	<0.03	0.088	River not previously sampled.
North Fork Maquoketa River DS from Cascade, Jones Co.	Hayes	Status	Smallmouth Bass	<0.09	<0.03	0.256	River not previously sampled.
Prairie Rose Lake near Harlan, Shelby Co.	Larson	Status	Channel Catfish	<0.09	<0.03	<0.0181	Lake not sampled for 10 years.
Prairie Rose Lake near Harlan, Shelby Co.	Larson	Status	Largemouth Bass	<0.09	<0.03	<0.0181	Lake not sampled for 10 years.
Swan Lake near Carroll, Carroll Co.	Miller	Status	Channel Catfish	<0.09	<0.03	0.028	Lake not previously sampled for RAFT.
Swan Lake near Carroll, Carroll Co.	Miller	Status	Largemouth Bass	<0.09	<0.03	0.102	Lake not previously sampled for RAFT.
Trumbull Lake Northeast of Spencer, Clay Co.	Christianson	Status	Common Carp	<0.09	<0.03	<0.0181	Lake not previously sampled for RAFT.
Trumbull Lake Northeast of Spencer, Clay Co.	Christianson	Status	Yellow Perch	<0.09	<0.03	0.021	Lake not previously sampled for RAFT.
Wapsipinicon River at Twin Ponds Park, Chickasaw Co.	Kalishek	Status	Channel Catfish	0.094	<0.03	0.142	River reach not previously sampled.
Wapsipinicon River at Twin Ponds Park, Chickasaw Co.	Kalishek	Status	Walleye	<0.09	<0.03	0.095	River reach not previously sampled.
Iowa River east of Wapello, Louisa Co.	Kline	Trend	Whole Common Carp	0.148	0.073	0.103	Trend site scheduled for 2003.
Maquoketa River NE of Maquoketa, Jackson Co.	Hayes	Trend	Whole Common Carp	0.333	<0.03	0.07	Trend site scheduled for 2003.
Mississippi River at Lansing, Allamakee Co.	Gritters	Trend	Whole Common Carp	0.155	<0.03	0.064	Trend site scheduled for 2003.
Skunk River NE of Wever, Lee Co.	Kline	Trend	Whole Common Carp	<0.09	0.11	0.102	Trend site scheduled for 2003.

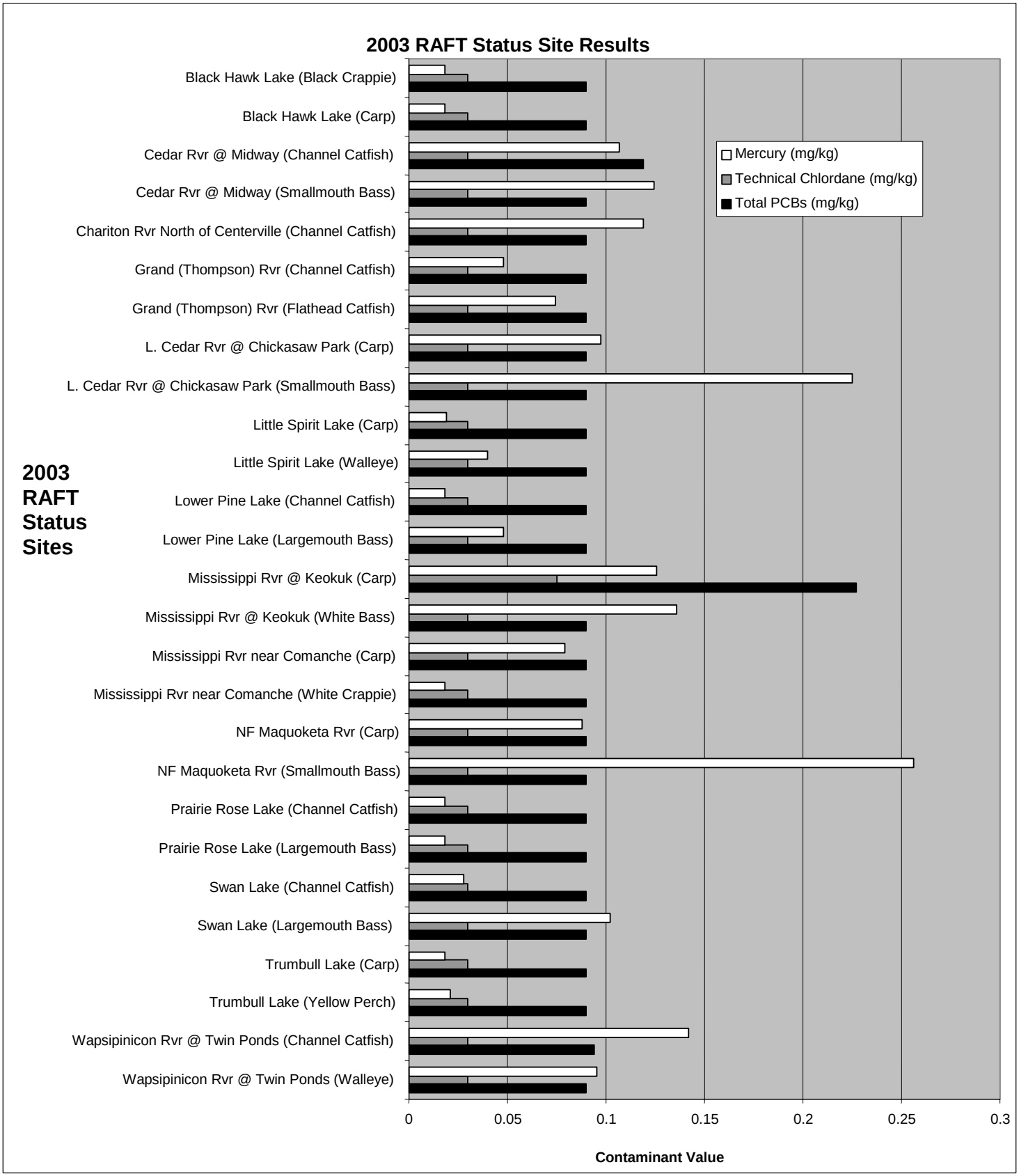

Figure 1. 2003 RAFT status sites and sample results for mercury, total PCBs (sum of Aroclors 1248, 1254 and 1260) and technical chlordane. The FDA action level for mercury is 1.0 ppm, for total PCBs is 2.0 ppm, and for technical chlordane is 0.3 ppm.

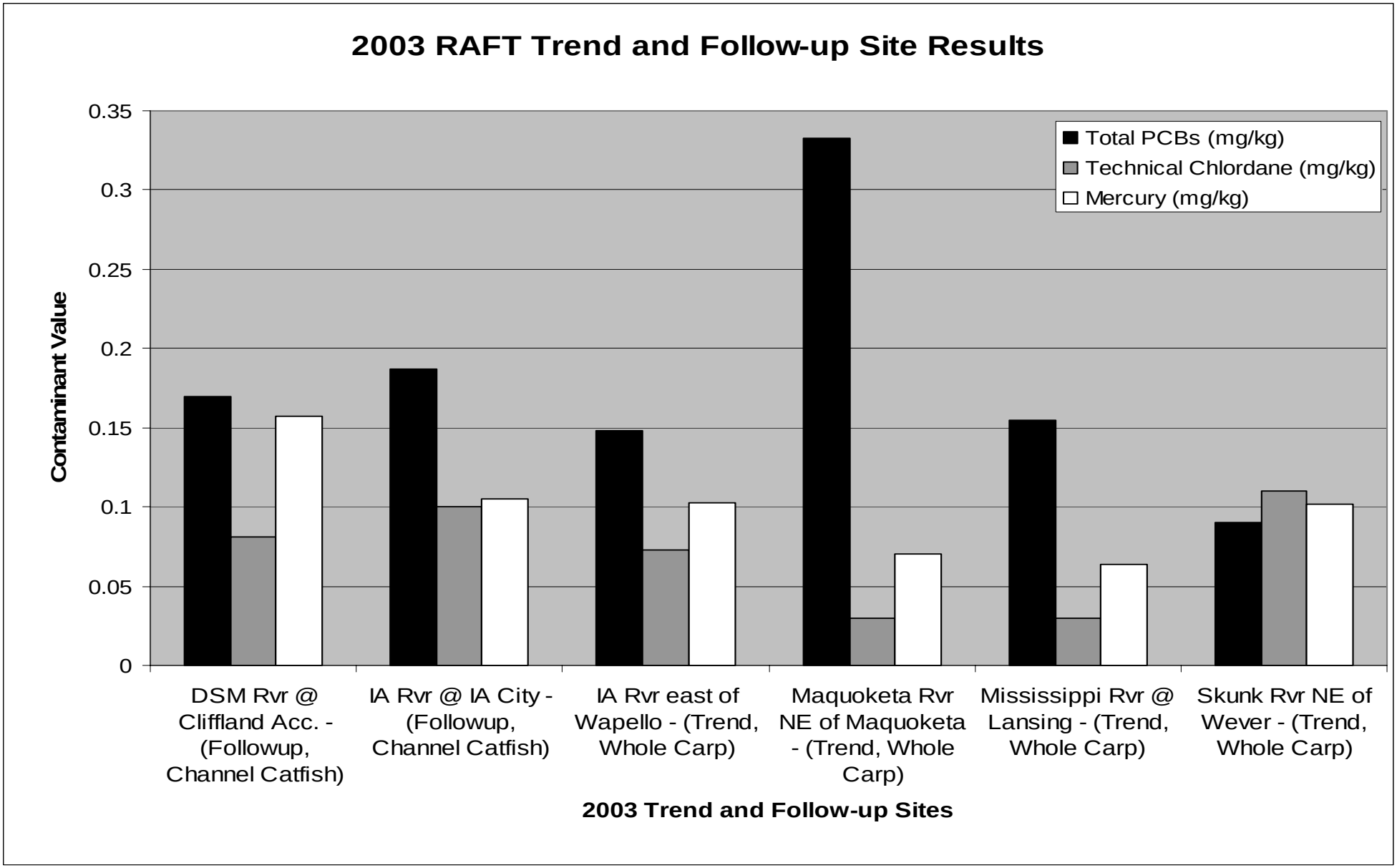

Figure 2. 2003 RAFT trend (whole-fish) and follow-up (fillet) sites and sample results for mercury, total PCBs (sum of Aroclors 1248, 1254 and 1260), and technical chlordane. The FDA action level for mercury is 1.0 ppm, for total PCBs is 2.0 ppm, and for technical chlordane is 0.3 ppm.